

**Report Title**

2007 Insect Resistance Management Compliance Assurance Program Report  
for Corn Borer-Protected Bt corn, Corn Rootworm-Protected Bt corn, and Corn Borer/  
Corn Rootworm-Protected Stacked Bt corn

**Data Requirement**

Condition of Registration for:

Corn Borer-Protected Bt Corn (EPA Reg. Nos. 524-489, 68467-2, 67979-1, and 29964-3),  
Corn Rootworm-Protected Bt Corn (EPA Reg. Nos. 524-528, 524-551, 68467-5, 67979-  
5, and 29964-4), and  
Corn Borer/Corn Rootworm-Protected Stacked Bt Corn (EPA Reg. Nos. 524-545, 524-  
552, 68467-6, 67979-8, and 29964-5)

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**Report Completion Date**

January 29, 2008

**Registrant Submitting**

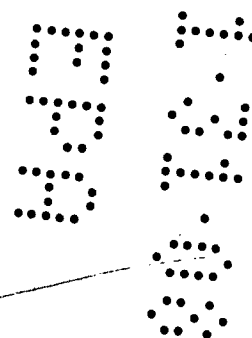
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Technical Committee

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**Project ID**

CAP-2007

Volume 1 of 1



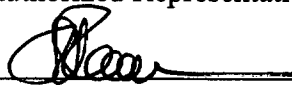
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Company: The IRM Stewardship Subcommittee of the Agricultural  
Biotechnology Stewardship Technical Committee  
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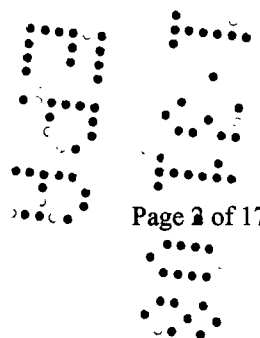
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\* Comprised of the following member companies: Dow AgroSciences LLC; Monsanto Company; Pioneer Hi-Bred International, Inc.; and Syngenta Seeds, Inc.


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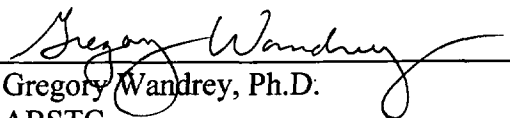
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### GLP Compliance Statement

This report does not meet the U.S. EPA Good Laboratory Practice requirements as specified in 40 CFR Part 160, as it is not a study but a report summarizing information compiled from third party, anonymous grower surveys and on-farm assessments by the ABSTC.

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### **Ownership Statement**

The "2007 Insect Resistance Management Compliance Assurance Program Report for Corn Borer-Protected Bt corn, Corn Rootworm-Protected Bt corn, and Corn Borer/Corn Rootworm-Protected Stacked Bt corn" report is the property of the IRM Stewardship Subcommittee of the ABSTC whose member companies include: Dow AgroSciences LLC; Monsanto Company; Pioneer Hi-Bred International, Inc.; and Syngenta Seeds, Inc.

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## Executive Summary

The third party, anonymous IRM grower survey<sup>1</sup> has been designed and conducted each year since 2000 by the independent marketing research firm, Marketing Horizons, Inc., of St. Louis, MO. The Agricultural Biotechnology Stewardship Technical Committee (ABSTC) has sponsored annual grower surveys for corn borer-protected Bt corn since 2000, and for corn rootworm-protected Bt corn and corn borer/corn rootworm-protected stacked Bt corn<sup>2</sup> since 2006. This year, due to the increasing complexity of growers' Bt corn planting practices and a need to standardize the grower survey across insect-protected traits, Marketing Horizons utilized an internet-based survey approach.

The 2007 grower survey responses indicated that the majority of growers adhered to the refuge size requirement for each Bt product type:

- 80% for corn borer-protected Bt corn
- 80% for corn rootworm-protected Bt corn
- 70% for stacked Bt corn

And to the refuge distance requirement for each product type:

- 88% for corn borer-protected Bt corn
- 79% for corn rootworm-protected Bt corn
- 66% for stacked Bt corn

In addition, further analysis of the survey results revealed that a significant portion of the growers not adhering to the refuge size requirement attempted to meet the requirements by planting a refuge between 15-20% of their total acres and/or ensuring that most of their Bt fields met the refuge distance requirement.

The 2007 on-farm assessments were conducted with growers representing a range of farm sizes over thirty (33) states (approximately a quarter of the farmers were categorized as "smaller growers" with less than 250 acres of corn). The results revealed that the majority of growers fully complied with all the refuge requirements for each product type they planted:

- 91% compliance for corn borer-protected Bt corn
- 90% compliance for corn rootworm-protected Bt corn
- 90% compliance for stacked Bt corn

In accordance with the Phased Compliance Approach, follow-up assessments of growers with significant deviations in 2006 resulted in no growers being denied access to the investigating company's Bt technology for the 2008 planting season.

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<sup>1</sup> Hereafter referred to as "grower survey", "internet survey" or "survey".

<sup>2</sup> Hereafter referred to as "stacked Bt corn".

The results of the on-farm assessments were similar to those found in previous assessment years and provide further evidence that the majority of growers are adhering to the IRM requirements for Bt technologies. In addition, the Phased Compliance Approach continues to prove to be a successful mechanism to bring non-compliant growers back into compliance.

## **Section I: Introduction**

The 2007 Compliance Assurance Program Report, compiled by the Agricultural Biotechnology Stewardship Technical Committee (ABSTC), describes industry-coordinated compliance assurance activities for insect resistance management (IRM) requirements associated with corn borer-protected Bt corn, corn rootworm-protected Bt corn and stacked Bt corn. The IRM Stewardship Subcommittee of ABSTC contributed to this report and the activities described herein. Membership of this Subcommittee consists of the following Bt corn registrants: Dow AgroSciences LLC; Monsanto Company; Pioneer Hi-Bred International, Inc.; and Syngenta Seeds, Inc.

This report represents the second year of ABSTC activities covering all Bt technologies (corn borer-protected, corn rootworm-protected and stacked Bt corn products)<sup>3</sup>. As described in the applicable compliance assurance programs (CAP)<sup>4</sup>, the registrants of insect-protected Bt corn products used two instruments to assess 2007 grower adherence to all Bt corn IRM requirements: an anonymous grower survey and on-farm visits. The grower survey has been conducted since the inception of the corn borer-protected Bt corn IRM program (2000) and has previously been a phone based survey. Complexity involved with surveying multiple Bt traits on the phone prompted changes to the survey methodology in 2007. Upon the recommendation of Marketing Horizons, and following consultation with the Agency<sup>5</sup>, an internet-based survey approach was used.

An ABSTC coordinated on-farm IRM assessment program was initiated in 2002 by each registrant as part of the EPA-mandated CAP for corn-borer protected Bt corn<sup>6</sup>. In 2006, the on-farm IRM assessment program was adapted to include corn rootworm-protected and stacked Bt corn products as mandated by the registrant specific CAPs for these products.

In fulfillment of the October 15, 2001 registration amendment letters for corn borer-protected Bt corn (amended subsequently in 2006) and registrations for corn rootworm-protected Bt corn and stacked Bt corn, this report includes a summary of the results of the 2007 third-party grower survey, 2007 on-farm assessments, CAP activities for the prior year, and plans for the CAP during 2008.

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<sup>3</sup> Prior to 2006, CAP activities for corn rootworm-protected Bt corn and stacked Bt corn were the responsibility of the registrant for each product.

<sup>4</sup> Refer to the Bt Corn IRM Compliance Assurance Program (submitted to EPA on September 24, 2002) and individual registrant Compliance Assurance Programs submitted in fulfillment of their rootworm-protected Bt corn and stacked Bt corn registrations.

<sup>5</sup> E-mail exchange and telephone discussions between David Guyer, representing ABSTC, and Mike Mendelsohn, BPPD, in June 2007.

<sup>6</sup> Refer to 2003 Insect Resistance Management Compliance Assurance Program Report for Corn Borer-Protected Bt corn (submitted to the EPA on January 29, 2004) for a comprehensive description of the on-farm assessment methodology.

## **Section II: Methodology**

### **1. IRM Third Party Grower Survey Methodology**

Prior to initiating the 2007 IRM grower surveys for corn borer-protected Bt corn, rootworm protected Bt corn, and stacked Bt corn, ABSTC met with the market research experts (Marketing Horizons) to review the survey strategy and methodology. Marketing Horizons strongly recommended a single, consolidated survey (i.e., one that surveys all product types) that growers could read, as opposed to conducting interviews over the phone, and proposed utilizing a call/internet-based approach. With the call/internet survey, growers were first contacted by phone and asked a series of basic questions about their corn borer-protected, rootworm-protected or stacked Bt corn planting practices. Qualified respondents (i.e., planting > 200 acres of corn and > 50 acres of Bt corn) were then directed to the internet, where the IRM questionnaire was available online. Once online, growers were sequentially prompted to respond to a series of questions about their Bt corn planting practices and IRM awareness. This approach allowed the growers time to complete the survey at their own pace, helping to ensure that they understood what was being asked, and allowed time for the growers to check their planting records if necessary to confirm that they were responding accurately. The consolidated survey questionnaire was very similar to the individual Bt product survey questionnaires used previously for the phone survey, and like the phone survey, the growers did not know that it was an IRM compliance survey until sufficient information had been collected for the assessor to determine adherence to the refuge requirements.

The sampling procedure and respondent qualification criteria were the same for all traits. Respondents were randomly selected and remained anonymous to protect the integrity of the responses. Respondents were screened using the same criteria that ABSTC previously used for the corn borer-protected Bt corn grower surveys. Specifically, respondents were required to: i) be actively involved in farming, ii) be the individual primarily responsible for decisions concerning seed purchase for their operation, and iii) not have worked for a farm chemical manufacturer, distributor or dealer, or for a seed company other than as a farmer/dealer, which also applied to family members.

The objectives of the grower survey were to i) determine the level of adherence to the IRM requirements, ii) measure awareness of the IRM requirements, iii) obtain grower feedback for improvement of educational and compliance programs, and iv) evaluate the potential biological significance of non-adherence to the requirements.

Details about the methodology of the grower survey are outlined below:

- Growers were recruited for the survey between August 23<sup>rd</sup> and September 20<sup>th</sup> and the internet based portion remained open for completion until October 2<sup>nd</sup>, 2007.
- The survey included growers of corn borer-protected, corn rootworm-protected and stacked Bt corn; participating growers were required to have planted a minimum of 200 acres of corn in 2007 (a minimum of 100 acres in the cotton

growing region) with a minimum of 50 acres of Bt corn. Due to the random nature of the survey, the sample size from cotton growing regions in 2007 was too small to perform meaningful analyses of the differences in results between this region and the Corn Belt.

- A total of 611 growers completed the internet survey. Some of the growers had multiple technologies on farm which resulted in the following survey completions by product type:
  - Four hundred and sixty-seven (467) planted corn borer-protected Bt corn.
  - One hundred and thirty-two (132) planted corn rootworm-protected Bt corn.
  - Four hundred and fifty-six (456) planted stacked Bt corn.

## **2. On-farm IRM Assessment Methodology**

Registrants and their seed company partners conducted over 2000 on-farm assessments during the 2007 growing season. The number of growers of each type of Bt corn who were assessed varied due to the market size of each product type. Growers were selected from individual company customer lists and included a range of farm sizes across thirty-three (33) states. Company representatives who made on-farm visits were trained on objectives and methodology prior to initiating the 2007 IRM assessments. As in previous years, the training was conducted through a variety of mechanisms (e.g., face-to-face meetings, electronic presentations) and included the key elements of the assessment program (e.g., IRM requirements, IRM assessment form, messages to growers, and follow-up actions).

Each registrant used a similar IRM assessment form. The introduction and company representative sections of the form were customized to suit the needs of each registrant, but the actual grower assessment questions were consistent across registrants. For 2007, all the ABSTC-represented companies asked the questions related to corn borer-protected, corn rootworm-protected, and stacked Bt corn. Completed assessment forms were submitted to a representative of the registrant for documentation.

Registrants responded to all compliance deviations identified in 2007 according to the common set of standards outlined in the Phased Compliance Approach. Examples of materials used as part of this follow-up process (e.g., educational material, warning letters, and compliance assistance contact form) have been provided to the Agency in previously submitted annual CAP reports. Names of the assessed customers were kept confidential by the registrant conducting the assessment.



## **Section III: Results**

### **1. Corn Borer-Protected Bt Corn**

#### **A. 2007 Grower Survey Results**

##### *i. Refuge Requirements*

A total of 467 growers who planted a corn borer-protected Bt corn product (i.e., Agrisure CB/LL, Herculex I, and/or YieldGard Corn Borer) in 2007 completed the internet-based IRM grower survey. These growers may or may not have also planted a stacked Bt corn product containing both a corn borer-protected and corn rootworm-protected trait.

Overall adherence to both the refuge size requirement and the refuge distance requirement remained high in 2007. Eighty percent (80%) of the growers planting corn borer-protected Bt corn met the size requirement, and a number of others made a good faith effort - 89% of growers surveyed planted at least a 15% corn borer refuge while 95% had at least a 10% corn borer refuge on farm. Of the growers who recalled the layout of all of their corn-borer protected Bt corn fields (447/467 growers), 88% of them planted refuge corn within ½ mile of each corn-borer protected Bt corn field.

For a comparison with previous year survey results, the 2007 internet survey data of growers who only planted corn borer-protected Bt corn on their farm (i.e., did not plant stacked Bt corn) was analyzed. These results track closely to historical survey results when the survey was conducted over the phone and before stacked Bt corn products were available. Of the 140 growers who planted corn-borer protected Bt corn but not stacked Bt corn, 89% adhered to the refuge size requirement and 87% of growers who recalled their field layout adhered to the distance requirement.

##### *ii. Grower Awareness of IRM Requirements*

As with previous years, the vast majority of growers surveyed (96%) said that they were aware of requirements for managing insect resistance. When asked on an unaided basis what growers recall about the specific IRM requirements, 63% correctly recalled the 20% refuge size requirement. When asked about the refuge distance requirement, 79% of growers knew on an unaided basis that the refuge must be planted within ½ mile of corn borer-protected Bt corn, a significant improvement compared to previous years.

##### *iii. IRM Education*

Results from the education portion of the survey remain unchanged from recent years. Growers indicated that (i) seed companies and their dealers are by far the most important sources of IRM information (92% and 95%, respectively) (ii) they are receiving multiple sources (e.g., technical guide, conversation with company representative) of IRM information (93% of growers received multiple sources), and (iii) they had enough information at the time of planting to establish and manage a Bt corn refuge (88% of growers).

## B. 2007 On-farm IRM Assessment Results

### *i. Results of "First Time" On-farm Assessments in 2007*

The results of the 2007 on-farm assessments, not including re-assessments of growers found to be non-compliant in 2006, are shown in Table 1 along with the results from previous years. The results of the 2007 on-farm assessments revealed that 91% of the growers fully complied with the refuge requirements (9% found to be out of compliance) and that significant deviations (6% or 129/2083) occurred more frequently than non-significant deviations (3% or 59/2083).

**Table 1. Annual cumulative results of first-time on-farm assessments**

Year	Number of Growers Assessed	Number (and per cent) of Compliant Growers	Number (and per cent) of Non-compliant Growers	Number of Significant Deviations	Number of Deviations that were not Significant
2007	2083	1895 (91.0%)	188 (9.0%)	129	59
2006	2020	1930 (95.5%)	90 (4.5%)	45	45
2005	2215	2089 (94.3%)	126 (5.7%)	75	51
2004	2130	2032 (95.4%)	98 (4.6%)	39	59
2003	1961	1789 (91.2%)	172 (8.8%)	104	68

Assessments were randomly conducted across a range of farm sizes, with approximately one-quarter of the growers categorized as "smaller growers" with less than 250 acres of corn. Analyses of those data indicate that compliance among smaller growers (87%) was similar to the level of compliance observed among larger growers (91%).

### *ii. Results of On-farm Re-assessments of Growers Found to be Out of Compliance in 2006*

Ninety (90) growers were found to be out of compliance in 2006 as part of the on-farm assessment process. Forty-five (45) of these compliance deviations met the definition of "significant" and forty-five (45) did not. All compliance deviations were responded to in accordance with the Phased Compliance Approach, including re-assessment in 2007. None of the growers re-assessed in 2007 met the criterion for revocation of access to corn borer-protected Bt corn according to EPA requirements (i.e., a significant deviation two years in a row). A small number of the growers re-assessed were no longer farming or did not plant Bt corn in 2007.

## 2. Corn Rootworm-Protected Bt Corn

### A. 2007 Grower Survey Results

#### *i. Refuge Requirements*

In 2007, 137 growers of corn rootworm-protected Bt corn completed the internet survey. These growers may or may not have also planted a stacked Bt corn product containing both a corn borer-protected and corn rootworm-protected trait. Adherence to the refuge size requirement, accounting for growers' total rootworm-protected traits including stacks, was 80%. A total of 86% of corn rootworm-protected corn growers surveyed planted at least a 15% refuge in an apparent "good faith" attempt to meet refuge size requirements. Adherence to the refuge distance requirement was 79%, unchanged from the previous year.

#### *ii. Grower Awareness of IRM Requirements*

Ninety-seven percent (97%) of corn rootworm-protected Bt corn growers surveyed in 2007 said they were aware of requirements for managing insect resistance and 63% correctly provided on an unaided basis the required refuge size. These unaided awareness levels are similar to or slightly higher than in 2006. Thirty-three percent (33%) of growers knew on an unaided basis that the refuge must be planted within or adjacent to the corn rootworm-protected Bt corn field (separated by only a road, path or ditch).

#### *iii. IRM Education*

As found in the surveys of growers on corn borer-protected Bt corn, corn growers regard seed companies and their dealers as by far the most important sources of information on IRM. Agrochemical retailers, crop consultants, grower guides/technology guide/use agreements, cooperative extension/university, and farm publications were also all cited as being important by more than 80% of respondents.

### B. 2007 On-farm IRM Assessment Program

#### *i. Results of "First Time" On-farm Assessments in 2007*

The results of the 2007 on-farm assessments, not including re-assessments of growers found to be non-compliant in 2006, are shown in Table 2 with the results from the previous year. The results of the on-farm assessments revealed that 90 % of the growers assessed fully complied with the refuge requirements (10 % found to be out of compliance).

**Table 2. Cumulative results of the 2006-2007 first-time on-farm assessments**

Year	Number of Growers Assessed	Number (and per cent) of Compliant Growers	Number (and per cent) of Non-compliant Growers	Number of Significant Deviations	Number of Deviations that were not Significant
2007	247	223 (90.3 %)	24 (9.7 %)	16	8
2006	395	374 (94.7 %)	21 (5.3 %)	11	10

Assessments were randomly conducted across a range of farm sizes, with approximately one-quarter of the growers categorized as “smaller growers” with less than 250 acres of corn. Those data indicate that compliance among smaller growers (93%) was similar to the level of compliance observed among larger growers (95%).

*ii. Results of Reassessments of Growers Found to be Out of Compliance in 2006*

Twenty-one growers were found to be out of compliance for corn rootworm-protected Bt corn in 2006 as part of the on-farm assessment process. Eleven (11) of these compliance deviations met the definition of “significant” and ten (10) did not. All compliance deviations were responded to in accordance with the Phased Compliance Approach, including reassessment in 2007. None of the growers re-assessed in 2007 met the criterion for revocation of access to corn rootworm-protected Bt corn according to EPA requirements (i.e., a significant deviation two years in a row). A small number of the growers reassessed did not farm or plant Bt corn in 2007.

### **3. Stacked Bt Corn**

#### **A. 2007 Grower Survey Results**

*i. Refuge Requirements*

A total of 456 growers planting stacked Bt corn were surveyed in 2007. These growers may or may not have also planted corn borer-protected Bt corn and/or corn rootworm-protected Bt corn products on their farm. These growers were assessed for their adherence to refuge requirements for both their corn borer and corn rootworm traits. The majority (70%) planted the required refuge sizes for both the corn borer and corn rootworm traits. A total of 82% of stacked Bt corn growers surveyed planted at least a 15% refuge in an apparent “good faith” attempt to meet refuge size requirements. Of the growers who recalled the layout of all of their stacked Bt corn fields (449/456), 66% planted a corn rootworm refuge within or adjacent to all of their stacked Bt corn fields, and a corn borer refuge within ½ mile of all of their stacked Bt corn fields.

*ii. Grower Awareness of IRM Requirements*

Ninety-six percent (96%) of growers planting stacked Bt corn surveyed in 2007 said they were aware of requirements for managing insect resistance. On an unaided basis, 62% of growers correctly identified the required 20% refuge size for corn borer-protected Bt corn while 55% of growers also correctly identified the 20% refuge requirement for corn rootworm-protected Bt corn. On an unaided basis, 77% of growers indicated that the refuge for corn borer must be a half-mile or less from the corn borer-protected Bt corn while 39% of growers reported that the refuge for corn rootworm must within the same field or in an adjacent field.

*iii. IRM Education*

As found in the surveys for corn borer-protected Bt corn and rootworm-protected Bt corn, stacked Bt corn, growers regard seed dealers and seed companies as by far the most important sources of information on IRM. Agrochemical retailers, crop consultants, grower guides/technology guide/use agreements, cooperative extension/university, and

farm publications were also all cited as being important sources of information by respondents.

## **B. 2007 On-farm Assessments**

### *i. Results of "First Time" On-farm Assessments*

The cumulative results of the 2007 on-farm assessments, not including re-assessments of growers found to be noncompliant in 2006, are shown in Table 3 with the results from the previous year. The results of the on-farm assessments revealed that 90% of the growers fully complied with the refuge requirements (10% found to be out of compliance).

**Table 3. Cumulative results of the first time on-farm assessments in 2007**

Year	Number of Growers Assessed	Number (and percent) of Compliant Growers	Number (and percent) of Noncompliant Growers	Number of Significant Deviations	Number of Deviations that were not Significant
2007	1069	959 (89.7%)	110 (10.3%)	77	33
2006	600	539 (89.8%)	61 (10.2%)	45	16

Significant deviations occurred in 7% (77/1069) of the assessments and non-significant deviations were recorded in 3% (33/1069) of the growers assessed.

Assessments were randomly conducted across a range of farm sizes, with approximately one-quarter of the growers categorized as "smaller growers" with less than 250 acres of corn. The data indicate that level of compliance among smaller growers (86%) was comparable to that of larger growers (91%).

### *ii. Results of Reassessments of Growers Found to be Out of Compliance in 2006*

Sixty-one (61) growers were found to be out of compliance for stacked Bt corn in 2006 as part of the on-farm assessment process. Forty-five (45) of these compliance deviations met the definition of "significant" and sixteen (16) did not. All compliance deviations were responded to in accordance with the Phased Compliance Approach, including reassessment in 2007. None of the growers re-assessed in 2007 met the criterion for revocation of access to corn rootworm-protected Bt corn according to EPA requirements (i.e., a significant deviation two years in a row). A small number of the growers reassessed did not farm or plant Bt corn in 2007.

## **Section IV: Tips and Complaints**

The registrants have developed mechanisms (e.g., customer service numbers) to receive alleged instances of non-compliance with the IRM requirements. The availability of these mechanisms continues to be communicated to growers, dealers, and sales representatives as part of the IRM education programs. In 2007, the registrants collectively received fourteen (14) tips and complaints. Legitimate tips and complaints (as defined in Section 2.3 of the corn-borer protected Bt corn CAP) were managed in

accordance with the CAP requirements. In other words, growers allegedly out of compliance who were identified as a result of a legitimate tip or complaint received an on-farm IRM visit and growers found to be out of compliance during this visit were responded to in a manner consistent with the Phased Compliance Approach.

## **Section V: Publicizing the Compliance Assurance Program**

The registrants have widely publicized the CAP, including the Phased Compliance Approach, which is common to all Bt corn registrations, to ensure growers are aware of the on-farm IRM assessment program and the penalties for noncompliance, including revocation of access to Bt technologies. The key elements of the CAP and Phased Compliance Approach are well integrated into each registrant's IRM education program, including company literature, internal training sessions, and meetings with growers and dealers. In addition, key stakeholder groups such as the National Corn Growers Association are educated by the ABSTC members and continue to inform their members of the CAP. Consistency of the CAP for corn rootworm-protected Bt corn and stacked Bt corn with the longer-established CAP for corn borer-protected Bt corn strengthens awareness.

## **Section VI: Discussion**

The results of the 2007 IRM grower survey and on-farm assessment program indicate that the majority of growers are continuing to adhere to the refuge requirements; however, the results are generally lower than what has been recorded in previous years. While ABSTC recognizes that the most recent results appear to represent a decline in the level of adherence with the refuge requirements, some of the differences may be attributed to inherent limitations of the survey methodology, especially where respondents may have combinations of different traits on their farms.

Upon the recommendation of the market research experts (Marketing Horizons), the IRM grower survey platform was changed in 2007 from a telephone interview to a call/internet-based approach. As new traits have been commercialized and growers' trait planting practices have become more complex, it was agreed that an internet approach would be a more appropriate mechanism to capture the information. As far as possible, the other parameters of the survey methodology (e.g., survey questions, sampling) were unchanged to allow a comparison of the data from year to year. Results observed for those growers who only planted corn-borer protected Bt corn (i.e., did not plant stacked Bt corn) suggest that the internet survey does not add significant biases to the data, however, it cannot be ruled out that changes in the survey methodology have accounted for some of the differences in the 2007 results as compared to past years.

While we believe the internet survey is an accurate and reliable tool to measure adherence with the refuge requirements, this approach does have limitations. A number of growers plant multiple insect-protected products (i.e., corn-borer protected Bt corn, rootworm protected Bt corn, and stacked Bt corn), however, they manage their refuges on a trait basis. In other words, they try to plant the appropriate corn borer refuges and

rootworm refuges on their farm, but they don't necessarily assign them to specific product types. This dichotomy can present challenges when the results are reported on a product basis as mandated by the EPA registrations. Consider, for example, a hypothetical grower who plants 450 acres of stacked Bt corn, 450 acres of corn borer-protected Bt corn, and 150 acres of non-Bt corn. While this grower clearly has not met the refuge size requirement on his farm, he has planted sufficient refuge for one of these product types, either the stacked Bt corn or for the corn borer-protected Bt corn. Unfortunately, it is not possible using the grower survey to determine which specific product type has adequate refuge. Therefore, this grower must be counted as not adhering to the refuge size requirements in both the corn borer-protected Bt corn and the stacked Bt corn sections of this report. In a sense, the grower is being "double-counted", and the number of growers not adhering to the refuge requirements is possibly inflated within each individual product type section. As the number of growers planting stacked Bt corn increases, as it did in 2007, the effect of this potential double-counting magnifies.

In contrast, the on-farm assessment process enables the grower to inform the company representative conducting the assessment on how refuge acres are assigned to specific insect-protected product types. In the previous example, the 150 non-Bt acres could be assigned as the refuge for either the stacked Bt corn or corn-borer protected corn. This difference in methodology could account for some of the discrepancy between the results reported by the grower survey and on-farm assessments. The on-farm assessment continues to be a consistent way to gauge growers that are out of compliance by specific trait and to correct those deviations through the Phased Compliance Approach.

While the survey and assessment methodology may account for some of the differences in results observed this year, ABSTC recognizes that the level of adherence with the refuge requirements is lower than in previous years. It's unlikely that this decline can be attributed to a single factor, but activities undertaken through the CAP have allowed us to identify a number of possible explanations:

*i. Last Minute Planting Decisions and Refuge Estimates:*

The results of the survey indicate that a significant number of growers not adhering to the refuge size requirement made a good-faith effort to do the right thing. Across product types, between 10% and 50% of growers with too little refuge actually planted between 15 and 20% refuge. There are several possible explanations for this finding:

- Growers may have estimated the required refuge acres based on their expected total corn acreage, while their actual corn acreage may have been higher (perhaps due to late decisions to increase corn acreage or caused by weather).
- Growers may have approximated their refuge and Bt acres, but inadvertently "just missed" the requirement when asked to specifically calculate the percentage or distances on the grower survey. For example, 14% of growers planting the corn borer-protected Bt corn not meeting the size requirement planted at least a 19% refuge.
- Finally, growers may have believed that a refuge size of "about" 20% is as good as a refuge size of at least 20%.

All of these possible explanations will be addressed by focusing education efforts on the requirement of at least the minimum refuge size.

*ii. Planting Multiple Products with Different Refuge Requirements:*

Interestingly, for growers planting corn borer-protected Bt corn only (i.e., did not plant stacked Bt corn), adherence levels were similar to levels seen in previous years. This result suggests that the reduction in overall levels of adherence to the requirements appears to be related to the use of corn rootworm traits, and especially stacked Bt corn. The different refuge distance requirements for corn rootworm traits probably create confusion. This assumption is supported by the results of the unaided awareness questions where the majority of growers knew the corn-borer refuge must be within a ½ mile (77 - 79%), but significantly fewer growers knew the specific rootworm refuge distance requirement (33 - 39%). In addition, attempts to optimize trait acreages by using the separate refuge option for the stacks may have led to miscalculations of the required refuge sizes (as suggested by the substantial proportion of growers planting almost the required refuge size).

Finally, it is important to note that, of the 101 growers identified in the on-farm assessment program as significantly out of compliance for insect-protected Bt corn products in 2006, not one was found to be significantly out of compliance in 2007. This result reinforces the effectiveness of the Phased Compliance Approach, and indicates that growers recognize the importance of being in compliance.

## **Section VII: Conclusions**

The results of the 2007 grower survey and on-farm assessment programs continue to demonstrate that the majority of Bt corn growers adhered to the IRM requirements for all Bt technologies. The ABSTC is further encouraged that the results indicate a significant portion of growers not fully adhering to the refuge requirements attempted to follow the IRM requirements, as illustrated by their attempts to plant the appropriate refuge on their farms. The 2007 results also continue to validate the effectiveness of the CAP for insect-protected Bt corn and the ongoing education efforts of ABSTC and individual member companies. In addition, the Phased Compliance Approach has again demonstrated it is a successful mechanism to bring non-compliant growers back into compliance.

ABSTC and Marketing Horizons believe that the consolidated internet-based approach should be pursued as a mechanism to capture complex planting information and assess adherence to the IRM requirements was demonstrated. ABSTC will continue to review, and revise when necessary, the IRM assessment tools and procedures to ensure as accurate information as possible is being collected.

The decline in the level of adherence with the refuge requirements has prompted the ABSTC to take proactive education steps to further enhance grower knowledge of the IRM requirements. The value of the on-farm assessment in identifying non-compliant growers and getting them back into compliance through the Phased Compliance



Approach has been demonstrated. However, there will be an increased effort in 2008 to eliminate first time compliance deviations. Robust individual company educational programs will be strengthened by ABSTC collaborations with external groups such as the National Corn Grower's Association (NCGA), the extension entomology community (e.g. NCR205, NCR46) and academics. The communication messages will focus on the different trait refuge requirements (i.e., corn borer refuge vs. rootworm refuge), resistance development risks and impacts, and our efforts to identify non-compliant growers through the CAP.

The enhanced industry IRM education campaign started in the fall of 2007 with an ABSTC and NCGA collaborative press release reminding growers of the risks associated with not planting a refuge and encouraging them to plan their refuges during winter seed invoicing. A follow-up press release will be issued in the spring of 2008, focusing on the decline in compliance and the possible ramifications to individual growers and trait durability. ABSTC will continue to partner with NCGA in 2008 in support of their "Respect the Refuge" campaign, a broad and intensive education program designed to increase IRM awareness. Plans for the Respect the Refuge campaign, some of which have already been implemented, include Bt corn IRM continuing education courses, roadside billboards, direct mailings and additional press releases. These efforts are designed to supplement the technical guides, brochures, direct mail pieces, etc. that each company already distributes with the objective of reversing non-compliance trends for 2008.